MONTANA UNIVERSITY SYSTEM

MUS Research Initiative

Funded Projects Brief

Total Funds Allocated = $14,920,395

Optics & Photonics, MSU: $2.5M

- Research team is partnering with 10 private MT companies to create 1) ultra-compact spectral imagers for precision agriculture, wild fire mapping, and natural resources; 2) hyperspectral imaging for monitoring cell growth and real-time image processing for disease studies, drug testing, and food sorting; 3) microcavity sensors for hyperspectral imaging for skin cancer detection, counterfeit drug detection, precision agriculture, and natural resources; 4) micro-mirror technology for microscopy, medical imaging, and astronomy; 5) active waveguides and integrated optical circuits that allow MSU and the MT companies to enter the multi-billion-dollar telecommunications and defense markets of optical waveguides and integrated photonic circuits; 6) optical parametric oscillator for tunable lasers for chemical gas detection; and 7) nonlinear optical detection of surface contaminants to assess drinking water contamination and pesticide usage.

Agricultural Profitability, MSU: $2.3M

- Researchers on MT campuses and the MT Ag Experiment Stations are 1) intensifying pulse and cover crop production on 4.6 million acres of Montana land left fallow between crops; 2) developing new/improved crops and practices such as peas with increased productivity under drought conditions and optical sensor-based nozzles for the precision spraying of weeds; and 3) increasing the adoption of precision ag technologies by helping farmers access data via an automated on-farm precision experimentation system.

Traumatic Brain Injury, UM: $2.2M

- Traumatic brain injury (TBI) affects 13% of Montana's adult population. Researchers are 1) expanding clinical services for TBI survivors and veterans at the UM Neural Injury Center to improve graduation rates; 2) developing a comprehensive panel of tests to diagnose mild TBI; 3) using molecular techniques to develop new therapeutic inhibitors; 4) developing a computer-based cognitive training system for TBI subjects with cognitive impairment; and 5) developing and testing a novel post-traumatic epilepsy diagnostic analysis program.

One Medicine, MSU: $1.5M

- Research aims to improve animal and human health by decreasing antibiotic resistance and developing new treatments for inflammatory and infectious disorders such as rheumatoid arthritis, calf scours, Herpes Simplex virus type 1, and West Nile virus.

Additional information on the MUS Research Initiative: http://mus.edu/research_initiative.asp

Diagnosis & Treatment of Mental Illness, MSU: $1.4M

- Research addresses Montana's high suicide and Alzheimer's rates by 1) developing a brain function analysis tool that improves speed & accuracy of the clinical diagnostic process; 2) conducting studies on the use of deep TMS (transcranial magnetic stimulation) at the Western MT Mental Health Center in Butte to treat alcohol abuse and depression; 3) investigating the development of a non-opioid treatment for chronic pain; and 4) adapting a rural intervention program focusing on suicide prevention in rural high school students.

Water Quality Monitoring, UM: $1.3M

- Research team is developing environmental measurement and sampling systems for monitoring water, with a focus on 1) detection of arsenate contamination; 2) separation and detection of organic and ionic pollutants; 3) detection of aquatic invasive species, pathogens, and endangered native species; and 4) continuous water quality monitoring via an autonomous titration and pH sensor.

Enhancing Montana's Energy Resources, MSU: $1.2M

- Research focuses on overcoming regulatory and environmental hurdles to access Montana's vast oil and coal reserves by 1) developing new technologies to seal small leaks in wells at deeper depths than traditional methods; 2) addressing leakage regulations for coal storage ponds by cementing fly ash; 3) assessing air capture of CO2 for algae growth for value added byproducts; 4) evaluating co-firing potential of coal with biomass; and 5) investigating use of potential coal related byproducts to enhance oil and gas recovery.

UAS Wildfire Management, UM: $900k

- Researchers in fire science and forest management partner with unmanned aircraft systems (UAS) specialists and entrepreneurs to design and test instruments and techniques for providing measurements of forests and fuels before fires occur, to stimulate the adoption of UAS in fire management at large.

Bio-Based Fuels, MSU-Northern: $800k

- Researchers aim to synthesize MT-grown industrial oilseeds into high-value chemicals and fuels by 1) producing camelina-derived aromatics as a blend component to aviation gasoline; 2) developing a catalyst that has the potential to significantly lower the operating cost of avgas production from camelina; and 3) designing a process for fuel pellet production from camelina meal, agricultural byproducts, and lawn clippings.

Recovery of Metal Contaminants from Industrial Wastewaters, MT Tech: $495k

- Chemists and engineers are developing a process to remediate acid rock drainage sites by 1) creating novel magnetic nanoparticles and 2) using the particles in a pipeline reactor to continuously extract heavy metal contaminants from wastewater in a concentrated form.

Remediation Technology, MSU-Billings: $263k

- Researchers are addressing a nationwide pollution issue by developing a bacteria-based molecule to clean up sites contaminated by carbon tetrachloride. The new technology allows pollution to be treated on-site rather than current methods of moving the hazard from one site to another.

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